



TLS inventory of single tree Oak Bartek in Zagnansk (Poland)



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"Bartek 3D" project

- In April 2013, in the Laboratory of Geomatics was started the project under acronym "Bartek 3D"
- Main aim of the project - monitoring, modeling and detection of changes in shape of the Oak Bartek
- Oak Bartek – monument of nature – permanent element in landscape
- Archival materials (measurements) were collected

Parameter / Year	1829	1920	1959	1968	1985
DBH ₁₃₀ [m]	2.52	2.65	2.83	2.87	3.06
Height of tree [m]	23.5	-	27.0	-	28.0
Age [years]	800	-	1000	640	685
Trunk BASE circumference [m]	-	13.4	13.4	-	13.4
Trunk DBH circumference [m]	7.92	8.32	8.90	9.00	9.20
Stem volume [m ³]	29.40	-	36.92	-	-
Branch volume [m ³]	38.68	-	48.08	-	-
Whole tree volume [m ³]	68.08	78.00	85.00	-	-

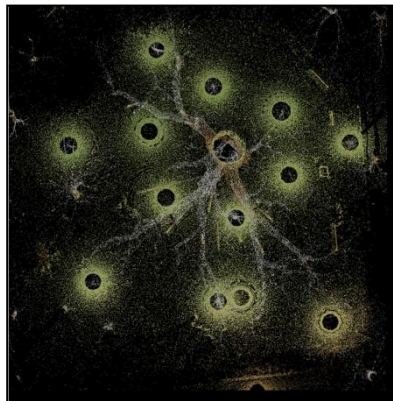
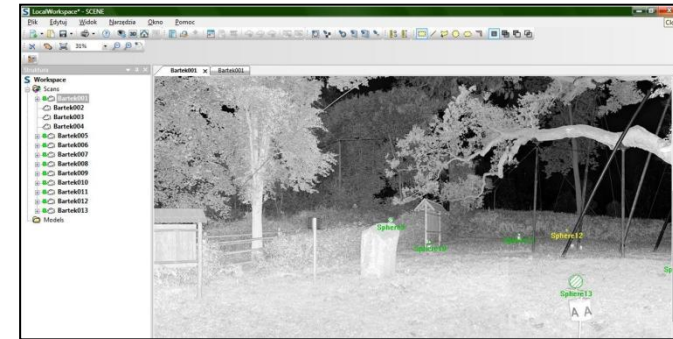


- TLS monitoring of the Oak were carried out in different phenological seasons: Leaf-OFF period (April 2013, 2014) and Leaf-ON (July 2013 and October 2014)
- Scanners: FARO FOCUS 3D, Leica C10 (AGH) and RIEGL VZ-400

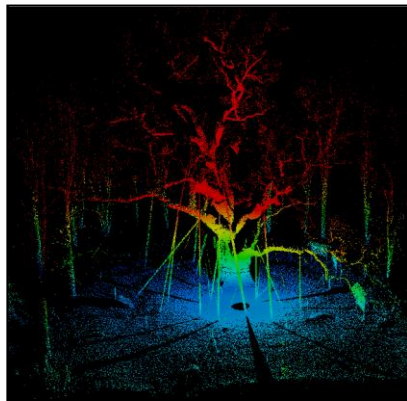


Oak Bartek – TLS inventory

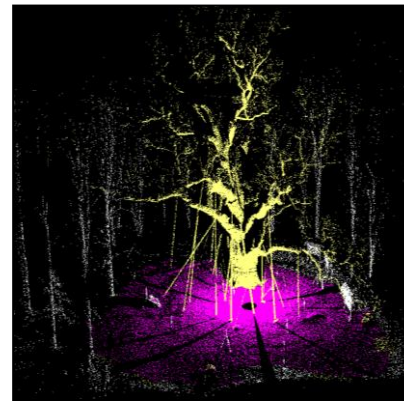
- TLS point clouds were obtained from several scanner positions
- Reference spheres were put for the process of combining scans.
- During the scanning a local coordinates system were used
- To give the TLS point clouds a right georeference, a high class GNSS receiver and total station was applied
- Processing - software: Faro Scene, Cyclone (Leica) TerraScan (Terrasolid) and Geomagic Studio



Top view



2.5D view: height above the ground (left)
classes: ground - purple, tree – yellow (right)



April 2013

- Precise scanning of the trunk – triangulation scanner



RevScan – HandyScan (Casp System)

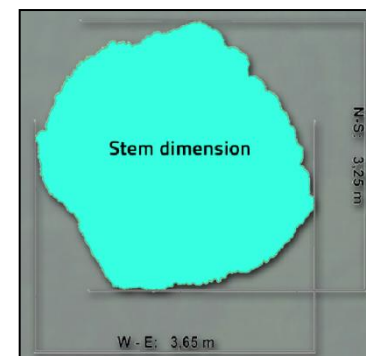
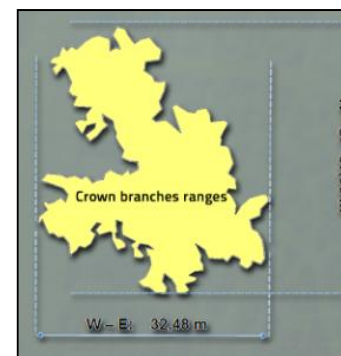


July 2013

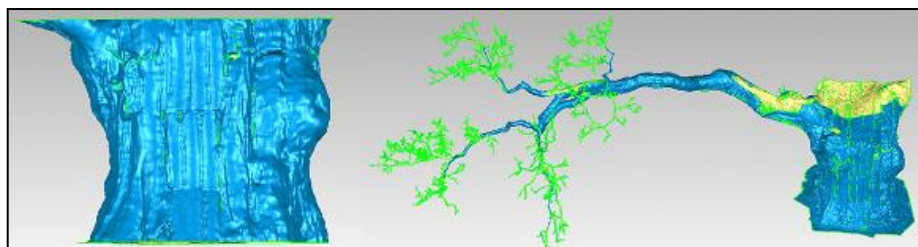
Planar view

TLS inventory – Results

Parameter	Traditional forest inventory measurement (reference)	TLS approach
Height of tree	Vertex (Haglölf) = 29.31 m	28.49 m
Trunk perimeter (L)	stretched tape: $L_T = 9.80$ m; adjacent along the shape of bark: $L_s = 13.70$ m	$L_{TLS} = 13.51$ m
DBH _{130cm}	3.14 m	DBH _{TLS} = 3.24 m
g – basal area	7.74 m ²	$g_{TLS} = 8.24$ m ²
Stem dimensions	n.a.	N-S=3.25 m / E-W = 3.65 m
Tree crown projection area	720 m ²	$A_{TLS} = 604$ m ²
Crown branches ranges	20 x 40 m	S: 37,95 m / E-W = 32.48 m
Volume (V)	72.0 m ³	122.5 m ³



Effect of semi-automatic 3D modeling (Geomagic)



Fragment of the trunk based on the HandyScan measurements

